

WHAT IS CLAIMED IS:

- 1 1. A human immunodeficiency virus antigenic composition
2 comprising a human immunodeficiency virus envelope glycoprotein 160 having a
3 gp120 subunit and a gp41 subunit wherein the carboxy-terminal end of gp120 is
4 covalently linked through a peptide linker of at least 5 amino acids, to the amino-
5 terminal end of gp41.
- 1 2. The antigenic composition of claim 1, wherein the human
2 immunodeficiency virus envelope glycoprotein 160 is truncated at a position within 5
3 amino acids either side of amino acid 683 in SEQ ID NO:2.
- 1 3. The antigenic composition of claim 1, wherein the peptide linker is
2 between 15 and 26 amino acids in length.
- 1 4. The antigenic composition of claim 1, wherein the peptide linker is
2 selected from the group consisting of SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ
3 ID NO:13, SEQ ID NO:14.
- 1 5. The antigenic composition of claim 1, wherein the human
2 immunodeficiency virus envelope glycoprotein 160 has at least 70% amino acid sequence
3 identity to sequence SEQ ID NO:2.
- 1 6. The antigenic composition of claim 1, wherein the human
2 immunodeficiency virus envelope glycoprotein 160 is SEQ ID NO:7.
- 1 7. The antigenic composition of claim 2, wherein the human
2 immunodeficiency virus envelope glycoprotein has at least 70% amino acid sequence identity
3 to sequence SEQ ID NO:4.
- 1 8. The antigenic composition of claim 2, wherein the human
2 immunodeficiency virus envelope glycoprotein is SEQ ID NO:8.
- 1 9. The antigenic composition of claim 1, wherein the gp120 subunit and
2 the gp41 subunit are from different human immunodeficiency virus strains.
- 1 10. The antigenic composition of claim 1, wherein the gp120 subunit and
2 the gp41 subunit are from the same human immunodeficiency virus strain.

1 11. A method of manufacturing a human immunodeficiency virus
2 antigenic composition comprising a human immunodeficiency virus envelope glycoprotein
3 160 having a gp120 subunit and a gp41 subunit wherein the carboxy-terminal subunit of
4 gp120 is covalently linked through a peptide linker of at least 5 amino acids to the amino
5 terminal end of gp41, the method comprising:

6 (i) obtaining a nucleic acid encoding a gp 120 and a gp 41.

7 (ii) introducing in frame between the gp120 and the gp41

8 coding segments a nucleic acid that encodes a peptide linker of between 6 and 29
9 amino acids, to yield a gene encoding a human immunodeficiency virus antigenic
10 composition;

11 (iii) operably linking the gene to a expression cassette;

12 (iv) incorporating the expression cassette into a mammalian
13 host cell;

14 (v) permitting the host to express the human
15 immunodeficiency virus antigenic composition; and

16 (vi) isolating the composition from the host cell.

1 12. The method of claim 11, wherein the human
2 immunodeficiency virus envelope glycoprotein 160 is truncated at a position
3 within 5 amino acids either side of amino acid 683 in SEQ ID NO:2.

1 13. The method of claim 11, wherein the peptide linker is between 15 and
2 26 amino acids in length.

1 14. The method of claim 11, wherein the peptide linker is selected from
2 the group consisting of SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13,
3 SEQ ID NO:14.

1 15. The method of claim 11, wherein the human immunodeficiency virus
2 envelope glycoprotein 160 has at least 70% amino acid sequence identity to sequence SEQ
3 ID NO:2.

1 16. The antigenic composition of claim 1, wherein the human
2 immunodeficiency virus envelope glycoprotein 160 is SEQ ID NO:7.

1 17. The method of claim 12, wherein the human immunodeficiency virus
2 envelope glycoprotein has at least 70% amino acid sequence identity to sequence SEQ ID
3 NO:4.

1 18. The method of claim 12, wherein the human immunodeficiency virus
2 envelope glycoprotein is SEQ ID NO:8.

1 19. The method of claim 11, wherein the gp120 subunit and the gp41
2 subunit are from different human immunodeficiency virus strains.

1 20. The method of claim 11, wherein the gp120 subunit and the gp41
2 subunit are from the same human immunodeficiency virus strain.

1 21. A vaccine for protecting a human from human immunodeficiency virus
2 infection comprising:

3 (i) an aliquot amount of a human immunodeficiency
4 virus antigenic composition comprising a human immunodeficiency virus
5 envelope glycoprotein 160 having a gp120 subunit and a gp41 subunit wherein
6 the carboxy-terminal end of gp120 is covalently linked through a peptide linker
7 of at least 5 amino acids to the amino-terminal end of gp41; and

8 (ii) a sterile pharmaceutically acceptable carrier.

1 22. The vaccine of claim 21, wherein the human
2 immunodeficiency virus envelope glycoprotein 160 is truncated at a position
3 within 5 amino acids either side of amino acid 683 in SEQ ID NO:2.

1 23. The vaccine of claim 21, wherein the peptide linker is between 15 and
2 26 amino acids in length.

1 24. The vaccine of claim 21, wherein the peptide linker is c selected from
2 the group consisting of SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13,
3 SEQ ID NO:14.

1 25. The vaccine of claim 21, wherein the human immunodeficiency virus
2 envelope glycoprotein 160 has at least 70% amino acid sequence identity to sequence SEQ
3 ID NO:2.

1 26. The vaccine of claim 21, wherein the human immunodeficiency virus
2 envelope glycoprotein 160 is SEQ ID NO:7.

1 27. The vaccine of claim 22, wherein the human immunodeficiency virus
2 envelope glycoprotein 160 has at least 70% amino acid sequence identity to sequence SEQ
3 ID NO:4.

1 28. The vaccine of claim 22, wherein the human immunodeficiency virus
2 envelope glycoprotein is SEQ ID NO:8.

1 29. The vaccine of claim 21, wherein the gp120 subunit and the gp41
2 subunit are from different human immunodeficiency virus strains.

1 30. The vaccine of claim 21, wherein the gp120 subunit and the gp41
2 subunit are from the same human immunodeficiency virus strain.

1 31. The vaccine of claim 21, wherein the aliquot amount of human
2 immunodeficiency virus antigenic composition is between 0.5 and 1 milligrams antigenic
3 composition per milliliter of sterile pharmaceutically acceptable carrier.

1 32. The vaccine of claim 21, wherein the aliquot amount of human
2 immunodeficiency virus antigenic composition is in a lyophilized state.

1 33. A method of protecting a human from human immunodeficiency virus
2 infection comprising:

3 administering to a human an amount of a human
4 immunodeficiency virus antigenic composition comprising a human
5 immunodeficiency virus envelope glycoprotein 160 having a gp120 subunit and a
6 gp41 subunit, wherein the carboxy-terminal end of gp120 is covalently linked
7 through a peptide linker of at least 5 amino acids to the amino-terminal end of
8 gp41, wherein the amount administered is effective to immunize the human
9 against human immunodeficiency virus infection.

1 34. The method of claim 33, wherein the human
2 immunodeficiency virus envelope glycoprotein 160 is truncated at a position
3 within 5 amino acids either side of amino acid 683 in SEQ ID NO:2.

1 35. The method of claim 33, wherein the peptide linker is between
2 15 and 26 amino acids in length.

1 36. The method of claim 33, wherein the peptide linker is selected from
2 the group consisting of SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13,
3 SEQ ID NO:14.

4 37. The method of claim 33, wherein the human immunodeficiency virus
5 envelope glycoprotein 160 has at least 70% amino acid sequence identity to sequence SEQ
6 ID NO:2.

1 38. The method of claim 33, wherein the human immunodeficiency virus
2 envelope glycoprotein 160 is SEQ ID NO:7.

1 39. The method of claim 34, wherein the human immunodeficiency virus
2 envelope glycoprotein has at least 70% amino acid sequence identity to sequence SEQ ID
3 NO:4.

1 40. The method of claim 34, wherein the human immunodeficiency virus
2 envelope glycoprotein is SEQ ID NO:8.

1 41. The method of claim 33, wherein the gp120 subunit and the gp41
2 subunit are from different human immunodeficiency virus strains.

1 42. The method of claim 33, wherein the gp120 subunit and the gp41
2 subunit are from the same human immunodeficiency virus strain.

1 43. The method of claim 33, wherein the amount administered effective to
2 immunize the human against human immunodeficiency virus infection is between 1µg/kg and
3 20µg/kg per dose per inoculation.

1 44. The method of claim 33, wherein the human immunodeficiency virus
2 antigenic composition further comprises one or more glycoprotein 160 ligands chosen from
3 the group consisting of CD4, CCR5 and CXCR4.

1 45. The method of claim 44, wherein the molar ration of glycoprotein 160
2 to ligand is between 3:1 and 1:3 for each ligand species of the composition.

1 46. An nucleic acid comprising a coding sequence for a human
2 immunodeficiency virus envelope glycoprotein 160 having a gp120 subunit and a gp41
3 subunit wherein the carboxy-terminal end of gp120 is covalently linked through a peptide
4 linker of at least 5 amino acids to the amino-terminal end of gp41.

1 47. A live recombinant vaccine comprising an nucleic acid comprising a
2 coding sequence for a human immunodeficiency virus envelope glycoprotein 160 having a
3 gp120 subunit and a gp41 subunit wherein the carboxy-terminal end of gp120 is covalently
4 linked through a peptide linker of at least 5 amino acids to the amino-terminal end of gp41.

1 48. The nucleic acid of claim 46, further comprising regulatory sequences
2 for the expression of DNA in eukaryotic cells operably linked to the human
3 immunodeficiency virus envelope glycoprotein 160 sequence.

1 49. The live recombinant vaccine of claim 47, further comprising
2 regulatory sequences for the expression of DNA in eukaryotic cells operably linked to the
3 human immunodeficiency virus envelope glycoprotein 160 sequence.

1 50. The antigenic composition of claim 1, wherein the human
2 immunodeficiency virus envelope glycoprotein 160 comprises the extracellular subunits of
3 envelope glycoprotein 160.

1 51. The vaccine of claim 21, wherein the human immunodeficiency virus
2 envelope glycoprotein 160 comprises the extracellular subunits of envelope glycoprotein 160.

1 52. The method of claim 33, wherein the human immunodeficiency virus
2 envelope glycoprotein 160 comprises the extracellular subunits of envelope glycoprotein 160.

1 53. The nucleic acid of claim 46, wherein the human immunodeficiency
2 virus envelope glycoprotein 160 comprises the extracellular subunits of envelope
3 glycoprotein 160.

1 54. The live recombinant vaccine of claim 47, wherein the human
2 immunodeficiency virus envelope glycoprotein 160 comprises the extracellular subunits of
3 envelope glycoprotein 160.

1 55. The human immunodeficiency virus antigenic composition of claim 1,
2 wherein the peptide linker is of 6 to 29 amino acids.

1 56. The method of claim 11, wherein the peptide linker is of 6 to 29 amino
2 acids.

1 57. The method of claim 33, wherein the peptide linker is of 6 to 29 amino
2 acids.

1 58. The nucleic acid of claim 46, wherein the peptide linker is of 6 to 29
2 amino acids.

1 59. The live recombinant vaccine of claim 47, wherein the peptide linker is
2 of 6 to 29 amino acids.

1 60. The nucleic acid of claim 46, wherein the human immunodeficiency
2 virus envelope glycoprotein 160 sequence is SEQ ID NO:7 or SEQ ID NO:8.

1 61. The live recombinant vaccine of claim 47, wherein the human
2 immunodeficiency virus envelope glycoprotein 160 sequence is SEQ ID NO:7 or SEQ ID
3 NO:8.

1 62. The nucleic acid of claim 46, further comprising a nucleic acid
2 encoding one or more glycoprotein 160 ligands chosen from the group consisting of CD4,
3 CCR5 and CXCR4.

1 63. The live recombinant vaccine of claim 47, further comprising one or
2 more glycoprotein 160 ligands chosen from the group consisting of CD4, CCR5 and CXCR4.

1 64. The vaccine of claim 21, further comprising (iii) one or more
2 glycoprotein 160 ligands chosen from the group consisting of CD4, CCR5 and CXCR4.

1 65. The method of claim 33, wherein the antigenic composition further
2 comprises one or more glycoprotein 160 ligands chosen from the group consisting of CD4,
3 CCR5 and CXCR4.

1 66. The method of claim 11, wherein the gp41 subunit is an extracellular
2 subunit(s) of gp41.

1 67. The nucleic acid of claim 46, wherein the peptide linker is between 15
2 and 26 amino acids in length.

1 68. The nucleic acid of claim 46, wherein the peptide linker is selected
2 from the group consisting of SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID
3 NO:13, SEQ ID NO:14.

1 69. The nucleic acid of claim 46, wherein the human immunodeficiency
2 virus envelope glycoprotein 160 has at least 70% amino acid sequence identity to sequence
3 SEQ ID NO:2.

1 70. The nucleic acid of claim 46, wherein the human immunodeficiency
2 virus envelope glycoprotein 160 is SEQ ID NO:7.

1 71. The nucleic acid of claim 46, wherein the human
2 immunodeficiency virus envelope glycoprotein has at least 70% amino acid sequence
3 identity to sequence SEQ ID NO:4.

1 72. The nucleic acid of claim 46, wherein the human immunodeficiency
2 virus envelope glycoprotein is SEQ ID NO:8.

1 73. The nucleic acid of claim 46, wherein the gp120 subunit and the gp41
2 subunit are from different human immunodeficiency virus strains.

1 74. The nucleic acid of claim 46, wherein the gp120 subunit and the gp41
2 subunit are from the same human immunodeficiency virus strain.

1 75. The live recombinant vaccine of claim 47, wherein the peptide linker is
2 between 15 and 26 amino acids in length.

1 76. The live recombinant vaccine of claim 47, wherein the gp120 subunit
2 and the gp41 subunit are from the same human immunodeficiency virus strain.

1 77. The live recombinant vaccine of claim 47, wherein the peptide linker is
2 selected from the group consisting of SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ
3 ID NO:13, SEQ ID NO:14.

1 78. The live recombinant vaccine of claim 47, wherein the human
2 immunodeficiency virus envelope glycoprotein 160 has at least 70% amino acid sequence
3 identity to sequence SEQ ID NO:2.

1 79. The live recombinant vaccine of claim 47, wherein the human
2 immunodeficiency virus envelope glycoprotein 160 is SEQ ID NO:7.

1 80. The live recombinant vaccine of claim 47, wherein the human
2 immunodeficiency virus envelope glycoprotein has at least 70% amino acid sequence identity
3 to sequence SEQ ID NO:4.

1 81. The live recombinant vaccine of claim 47, wherein the human
2 immunodeficiency virus envelope glycoprotein is SEQ ID NO:8.

1 82. The live recombinant vaccine of claim 47, wherein the gp120 subunit
2 and the gp41 subunit are from different human immunodeficiency virus strains.

1 83. The nucleic acid of claim 62, wherein the molar ration of glycoprotein
2 160 to ligand is between 3:1 and 1:3 for each ligand species of the composition.

1 84. The live recombinant vaccine of claim 63, wherein the molar ration of
2 glycoprotein 160 to ligand is between 3:1 and 1:3 for each ligand species of the composition.